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Japanese Energy Security: Prospects and Implications

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An Intelligence Assessment

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April 1983

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Japanese Energy Security: Prospects and Implications

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An Intelligence Assessment

This assessment was prepared by [redacted]
the Office of Global Issues. Comments and queries
are welcome and may be directed to the Chief,
Energy Issues Branch, [redacted]

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**Japanese Energy Security:
Prospects and Implications**

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Key Judgments

*Information available
as of 18 March 1983
was used in this report.*

Japan will remain extremely vulnerable to oil-supply disruptions over the next two decades. Imported oil will account for about half of Japan's energy needs through the year 2000, and the bulk of Japan's oil supplies probably will continue to come from politically unstable Persian Gulf sources. At the same time, Japan will continue to rely heavily on imports for coal and natural gas supplies because domestic production of all hydrocarbons is extremely limited.

Although lowered prospects for economic growth have sharply reduced Japanese energy needs over the next two decades, slow development of nonoil energy sources will leave Japan heavily dependent upon imported oil. Recent Japanese private-sector forecasts place the use of natural gas, coal, nuclear power, and new energies at only 3.8 million barrels per day of oil equivalent (b/doe) in 1990—1.6 million b/doe below official government projections. Several factors will limit the growth of oil alternatives:

- Increased use of liquefied natural gas (LNG) will be impeded by its high price relative to fuel oil and the inflexibility of "take or pay" clauses in producer contracts.
- Coal use will be constrained by environmental regulations, high capital costs, limited space for coal storage and preparation facilities, and ash disposal problems.
- Nuclear power will require huge capital outlays and face public opposition and siting difficulties.
- New energy sources, such as coal synfuels, will be hindered by technological developments and cost factors.
- Funds for developing all nonoil energy sources probably will be limited by government efforts to balance the budget.

Taking these factors into account, we believe there is little potential for Japan to significantly expand use of nonoil energy sources beyond estimated levels. As a result, Japan will need to concentrate greater efforts on minimizing the country's vulnerability to a cutoff in Middle East oil supplies, including:

- Accelerating efforts to diversify oil supplies away from Persian Gulf sources.
- Boosting government-owned oil stocks.
- Strengthening the oil-refining sector to ensure greater supply flexibility.
- Easing or reversing the trend toward increased reliance on direct-deal purchases from producing countries.

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US options for enhancing Japanese energy security are limited. The export of Alaskan oil to Japan—which could reduce the Persian Gulf's share of Japan's imports by about 10 percentage points and lessen Arab leverage on Japan—is viewed with little enthusiasm in Japan. According to Japanese statements, Tokyo has been concerned that such oil shipments could be diverted to US domestic use in the event of a global supply disruption. Natural gas from the North Slope could obviate the need for Soviet gas and reduce dependence on Indonesian supplies, but Tokyo has already contracted for all the gas it will need until 1990. Beyond 1990, additional gas requirements will probably be insufficient to support economic construction of the proposed Alaskan gas pipeline. As for coal, prospects for increased sales look bleak. Indeed, Japanese coal requirements in 1990 will probably fall short of government projections by over 500,000 b/doe, and purchases of US coal could well decline from present levels because of the high cost of US coal and stiff competition from other suppliers.

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Japanese Energy Security: Prospects and Implications

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Energy in Japan

Paralleling dramatic economic growth, Japanese energy consumption rose sharply during the 1960s and early 1970s—jumping from 1.9 million barrels per day of oil equivalent (b/doe) in 1960 to 7 million b/doe in 1973. Cheap imported oil met most of Japan's burgeoning energy needs, and by 1973 dependence on imported oil stood at 77 percent of total energy use. Rapid growth in energy and oil demand ended abruptly following the 1973 oil crisis. Through 1982, total energy consumption increased by less than 300,000 b/doe, and oil use declined by over 900,000 b/doe.

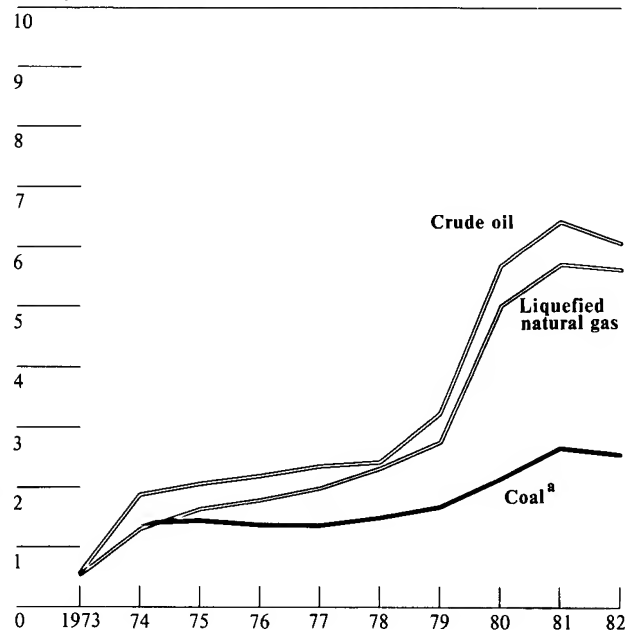
Sluggish growth in energy demand and the falloff in oil use can be traced to slower economic growth and sharply higher oil prices. Annual economic growth rose an average of 3.4 percent between 1973 and 1982—approximately one-third the rate of the 1960-72 period. On the price front, imported crude oil prices increased more than ninefold after 1973 (figure 1)—spurring major improvements in energy efficiency. The energy-to-GNP ratio—a measure of an economy's energy efficiency—has fallen 25 percent since 1973 and is the lowest of any major industrialized country. The ratio of oil to GNP has fallen even faster (figure 2). Contributing to these declines has been a structural shift in the economy away from heavy, energy-intensive industries, such as steel, to processing and assembling industries with low energy inputs, such as electronics.

Interfuel substitution has further reduced oil demand:

- Increased use of natural gas, coal, and nuclear power in electricity generation has slashed annual oil requirements by nearly 350,000 b/doe since 1973.
- Conversion to coal in the cement industry following the 1979 oil price hikes has cut annual oil use by over 130,000 b/d.
- In the steel industry, substitution of coal for oil in blast furnaces has reduced annual oil consumption by about 110,000 b/d since 1973.

Figure 1
Energy Import Prices

US \$ per million Btu



^aSteam coal imports were restricted prior to 1974.

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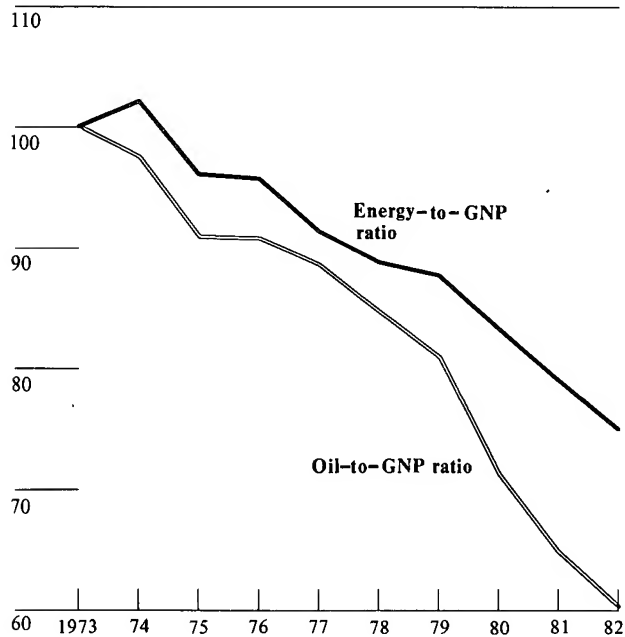
Japan, however, still faces a serious energy security problem. Poor in domestic resources, Japan—the second-largest non-Communist economy—depends upon imported energy for over 80 percent of its energy needs. Imported oil is the dominant fuel in all sectors of the economy and accounts for over 60 percent of the country's total energy consumption. Nearly two-thirds of Japan's oil requirements, moreover, come from the politically unstable Persian Gulf region (figure 3).

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Figure 2
Measures of Efficiency

Index: 1973=100



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Changing Outlook

Sharply lowered prospects for economic growth, together with structural changes in the economy, have transformed the outlook for Japanese energy demand. In the past year alone, Japanese Government and private-sector forecasts of 1990 energy needs have been trimmed by about 10 to 20 percent (figure 4). Japan's recent record on conservation, together with lower projections for economic growth in the years ahead, accounts for these more moderate demand projections. The maturation of the Japanese economy and its transformation into a high-technology service economy will further restrain energy demand. According to the Japanese Economic Council, the share of gross domestic product accounted for by the service sector will rise from 33 percent in 1980 to nearly 50 percent by the year 2000.

Demand Projections. The most recent Japanese Government forecast estimates that 1990 energy needs will total 10.7 million b/doe. We believe that this projection is too high, because it assumes 5-percent annual economic growth. According to the International Energy Agency, the Japanese Economic Advisory Council is revising its midterm economic forecasts, which Japanese observers suggest are likely to show annual economic growth of 3.5 to 4 percent. Recent Japanese private-sector projections already contain more realistic growth assumptions (table 1):

- The Petroleum Association of Japan and the Bank of Tokyo project 1990 requirements at around 9 million b/doe.
- The Institute of Energy Economics in December dropped its base 1990 forecast to 8.3 million b/doe.

On the basis of the most recent Japanese private-sector forecasts and assuming an annual economic growth rate of about 3 percent, we believe Japanese energy requirements will total 8-8.5 million b/doe in 1990 compared to about 7.3 million b/doe last year. By the year 2000, energy demand probably will be roughly 8.8-9.3 million b/doe—assuming about a 3-percent annual GNP growth rate during the 1990s and continued improvements in energy conservation (table 2). Although real economic growth may prove higher than what we have assumed for the 1990s, it would not necessarily result in corresponding gains in energy consumption, since much of Japan's future economic expansion will occur in high-technology and service industries rather than in energy-intensive industries.

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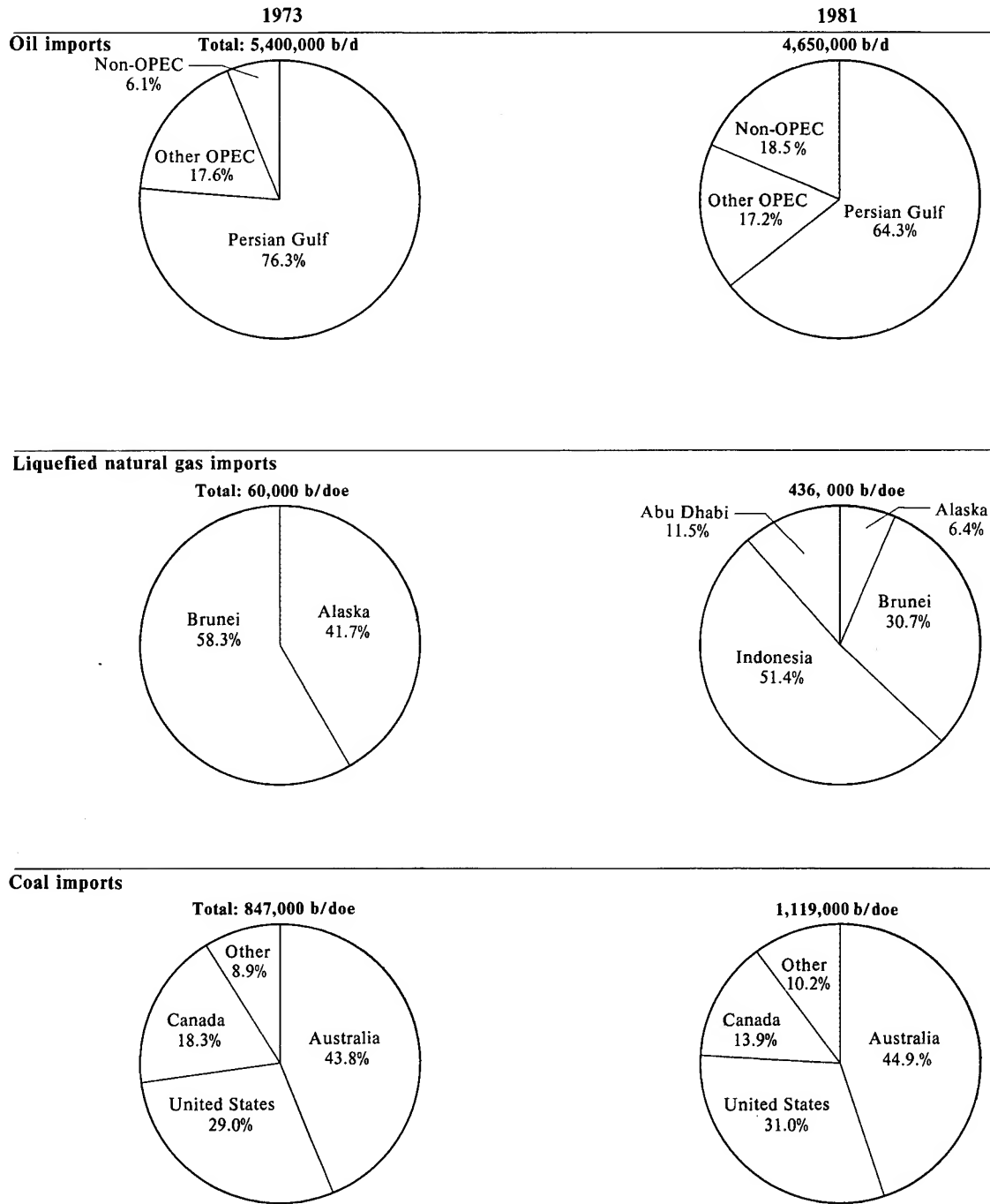
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Figure 3
Energy Imports



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**Japanese Energy Policy:
Looking to the 1990s**

The key objectives of Japan's energy policy are: securing a stable oil supply, reducing dependence upon imported oil through the development and introduction of alternative energy sources, and continuing energy conservation efforts. []

Oil Supply. *Despite Japan's goals, the economy apparently remains highly vulnerable to supply disruptions. Tokyo recognizes that this vulnerability will not change much in the future. With security of supply in mind, the Japanese Government has worked hard to keep smooth relations with oil-exporting countries. The government itself has worked out government-to-government oil deals (for instance with Mexico), and energy and related investment projects in OPEC countries (such as large petrochemical plants in Saudi Arabia); and it has sponsored oil-exploration projects in Communist countries (China and the Soviet Union) and in OECD countries (Canada). In the short term, private and government oil stockpiles are considered an important part of the country's oil-supply security. Under law, privately owned stockpiles must equal a 90-day supply. The government-owned oil-stockpiling program eventually envisions maintaining 315 million barrels of crude oil—a 66-percent increase over the previous plan. At the end of September 1982, both government and private stocks stood at 436 million barrels—roughly a 120-day supply—but government stocks, at only 66 million barrels, were far short of planned levels.* []

Oil Alternatives. *Through increased use of liquefied natural gas (LNG), coal, nuclear power, and unconventional energy sources, Japan plans to lower its dependence on imported oil to 49 percent of total energy use in 1990 and only 38 percent in the year 2000. Nonoil energy sources are projected to meet nearly all of Japan's future energy needs, with oil requirements through the end of the century forecast at about the 1980 level. To ensure stable supplies of LNG and coal, Japan is seeking to diversify its sources of supply; it has already signed long-term contracts with six countries for LNG supplies and has equity interest in coal development projects in several countries.* []

Energy Conservation. *With only limited ability to expand domestic energy production, energy conservation occupies an important place in Japan's energy program. The government currently offers low-interest loans, special depreciation allowances, and tax deductions for energy-saving equipment. By 1990, Tokyo estimates that conservation efforts will reduce the amount of energy required to produce a unit of GNP by nearly 16 percent compared with 1980, thus saving an estimated 1.9 million b/doe in 1990 alone.* []

Energy Demand by Source

Oil. *Despite prospects for slow growth in energy consumption, Japan will remain heavily dependent on oil over the next two decades. On the basis of our assessment of the development of nonoil energy sources, we believe oil consumption will total about 4.5 million b/doe in 1990 and around 4.3 million b/doe in the year 2000. As a result, imported oil will account for nearly 55 percent of Japan's energy requirements in 1990 and for just under 50 percent by the end of the century.* []

Natural Gas. *Because of Japanese efforts to reduce oil use and the clean burning properties of gas, demand for natural gas is likely to grow more rapidly than the demand for any other major fuel during the 1980s. Gas requirements, however, will be substantially less than the Japanese were expecting when they initiated many of their gas-supply projects in the mid-1970s. We believe Japan's gas needs will rise from current*

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contracts, heavy fuel oil—a lower quality byproduct of crude oil and a major fuel in electric utilities and industry—is cheaper than LNG. LNG contracts, moreover, contain inflexible “take or pay” clauses. As a result, industry sources foresee little growth in gas use for electricity generation beyond 1990, and the projected increase in industrial gas requirements is minimal. Present contractual obligations will provide supplies for the rapid growth in gas demand during the 1980s. [REDACTED]

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Coal. We believe coal requirements in 1990 will fall far short of government projections. Lower-than-expected growth in electricity demand has reduced the need for new power plants. Because of existing LNG commitments and nuclear power plants under construction or site approved, we believe the bulk of the reduction in new power plant construction will be in coal. [REDACTED] over 6 gigawatts (GW) of coal-fired capacity representing about 160,000 b/doe have already been scrapped or delayed until the 1990s; additional delays or cancellations are possible. Declining oil prices and rising coal prices, moreover, have recently made the construction of new coal-fired plants uneconomic compared to continuing the operation of existing oil-fired facilities. The steel and cement industries have already converted their facilities from oil to coal, and we believe future growth in industrial coal use will be sluggish. [REDACTED]

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Taking these factors into account—along with low growth in steel production, which currently accounts for about three-quarters of Japan’s coal use—we place Japanese coal requirements in 1990 at around 1.5 million b/doe—only about 140,000 b/doe above the 1981 level. Through increased use of coal for electricity generation, total coal requirements in the year 2000 could reach 1.8-1.9 million b/doe, still sharply below current government projections of 2.7 million b/doe. [REDACTED]

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levels of about 500,000 b/doe to approximately 950,000 b/doe in 1990. This forecast, while in line with Japanese private-sector forecasts, is roughly 250,000 b/doe below the official Japanese Government projection. According to industry sources, gas requirements beyond 1990 are likely to increase by only about 100,000 to 200,000 b/doe—far below government growth projections. [REDACTED]

Current price trends and contractual obligations have led to lower gas demand estimates. With the price of imported LNG tied to crude oil prices in current

Nuclear Power. Japan has the world’s third-largest nuclear power program—ranking behind only the United States and France. Future growth in nuclear power, however, is constrained by lower levels of

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projected electricity demand, public opposition, and siting difficulties. Of the 30 GW of capacity planned to be added during the 1980s, we believe only 11 GW are likely to be in operation by 1990, given current construction leadtimes. As a result, we place output from nuclear power in 1990 at 700,000 to 800,000 b/doe—400,000 b/doe below government projections.

By the year 2000, our analysis indicates nuclear power output probably will reach about 1.1-1.2 million b/doe—at least 1.3 million b/doe below official government projections.

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Table 2
Japan: Energy Demand

Thousand b/d oil equivalent

	1973	1980	1981	1990	2000
Total energy use	7,016	7,552	7,434	8,000-8,500	8,800-9,300
Total imports	6,307	6,508	6,205	6,550-6,900	6,800-7,150
Oil consumption	5,421	5,000	4,742	4,450-4,550	4,300-4,400
Domestic production	14	10	8	50	50
Imports	5,400	5,091	4,650	4,400-4,500	4,250-4,350
Of which:					
Persian Gulf	4,120	3,547	2,990	2,600-2,700	2,350-2,450
Other OPEC	950	765	799	850	850
Total OPEC ^a	5,070	4,312	3,789	3,450-3,550	3,200-3,300
Other ^b	330	779	861	950-1,050	1,050
Natural gas consumption	110	475	491	900-1,000	1,050-1,150
Domestic production	50	41	55	50	50
Imports	60	434	436	850-950	1,000-1,100 ^c
Of which:					
Indonesia		219	224	385	360-560
Abu Dhabi		50	50	55	0-240
Brunei	35	143	134	130	
Alaska	25	22	28		
Malaysia				155	155
Australia				125-150	155
USSR				0-75	75
Canada					75
Qatar					0-155
Thailand					0-100
Coal consumption	1,099	1,239	1,362	1,500-1,600	1,750-1,850
Domestic production	252	214	209	150-200	150-200
Imports	847	983	1,119	1,300-1,450	1,550-1,700
Of which:					
Australia	371	426	502	600-650	700-775
United States	246	290	347	300-325	350-375
Canada	155	162	156	200-250	250-275
Other	75	105	114	200-225	250-275
Hydro and other	340	447	433	450-550	600-700
Nuclear power	46	391	406	700-800	1,100-1,200

^a Includes OAPC members.^b Including unknown.^c Imports will not add to the total due to the uncertainty surrounding future LNG projects.

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New Energies.¹ According to industry forecasts, unconventional energy sources—such as solar, wind, biomass, and synthetic fuels—are unlikely to reduce Japan's dependence upon imported oil over the next two decades. The lower estimates are based on reductions in projections of future oil price levels, which have lessened the perceived need to develop new energy sources. Moreover, industry sources indicate there is still great uncertainty about the ability to develop the needed technology on a commercial scale. Sluggish oil and electricity consumption have also reduced government revenues from oil and electricity taxes—the primary sources of funds for alternative energy development. [REDACTED]

Effect of an Oil Price Decline

Moderate oil price declines of 10 to 15 percent would have several benefits for Japan. A sharp, sustained oil price decline, however, could significantly worsen Japanese energy security by increasing Japanese requirements. A recent assessment by the Japanese Economic Planning Agency and Japanese private-sector forecasts, for example, indicate that a 10-percent decline in oil prices would boost energy requirements by about 300,000 b/d over a three-year period. Given the OPEC price reduction on 16 March and assuming the real price of crude remains at that level through the balance of the decade, energy demand in 1990 could approach 8.5 million b/doe—the high end of our projected range. Although the bulk of additional demand would be met by oil, increased electricity generation could spur construction of new coal and nuclear power plants. Some existing oil-fired capacity could thus be retired or used only for peak-load demand. Additional government revenues from oil and electricity consumption taxes, moreover, would provide added funds for alternative energy development. [REDACTED]

A larger decline in oil prices to \$20 to \$25 per barrel, however, would probably have a strong negative impact on coal and gas use, particularly in the longer term. Industry sources estimate that real oil prices of around \$27 per barrel in 1985 and \$28 per barrel in

Japan: Sectoral Energy Use and Substitution Potential

Energy demand in all sectors of the Japanese economy will grow, but much less rapidly than government planners predict because of slower growth prospects and structural changes in the economy. Given present government policies and technical and economic constraints, only electric utilities are likely to reduce their dependence on oil significantly over the next two decades (figure 5). [REDACTED]

Industrial Use

Industry is the largest energy-consuming sector. Because of the continuing shift to less energy-intensive industries, future growth in energy demand probably will be sluggish. [REDACTED]

Oil is likely to remain the dominant industrial fuel over the next two decades due to the limited potential for fuel substitution. Increased coal use is constrained by environmental regulations, high capital costs, limited space for coal storage and preparation facilities, and problems regarding ash disposal and access to coal supplies. Capital costs for coal, for example, are generally two to four times greater than for oil or gas. The residue ash from burning coal creates immense disposal problems in a densely populated country like Japan. Although LNG use avoids many of the problems associated with coal, its high price relative to fuel oil and the inflexibility of "take or pay" contracts are likely to impede its penetration in the industrial sector. Industrial electricity demand should trend upward because of the increased production of computers, industrial robots, and machine tools. The high price of electricity, however, largely rules out supplanting oil through increased use of electricity. [REDACTED]

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Residential/Commercial Use

According to private-sector forecasts, energy demand is projected to grow at the fastest rate in the residential and commercial sectors. Growth of the service economy, higher living standards, additional construction, and the increased use of cooling systems will tend to boost total energy requirements. Electricity is likely to be the fastest growing source of energy in this sector if forecasts of increased price competitiveness with other fuels prove correct and consumers continue to prefer clean energy sources. Natural gas and oil needs will also trend upward. Widespread substitution of gas for oil, however, is constrained by the high prices of gas and the lack of a gas distribution infrastructure outside of Japan's major cities. []

to around 40 percent at present. The high cost of generating electricity from oil compared to coal and nuclear power and the greater supply security of LNG account for the projected sharp decline in oil use. []

Changing Product Demand

Japan's oil requirements are rapidly shifting to lighter grade petroleum products (figure 6). Increased oil use in the residential, commercial, and transport sectors have raised the demand for light- and medium-weight distillates, while fuel substitution efforts in industry and electric utilities have decreased the demand for heavy oils. By 1990, industry sources estimate heavy oils will account for only 28 percent of domestic oil demand compared to 38 percent in 1980. []

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Transport

Energy requirements in the transport sector are also likely to rise, according to industry sources. Despite improvements in engine fuel efficiency, gas and diesel fuel needs will trend upward because of increased numbers of cars and trucks, more travel, and the increased use of air conditioners and automatic transmissions. []

Declining oil demand combined with rising oil prices in yen terms, however, have caused heavy losses for many refiners. In fiscal 1981, Japanese oil-refining and marketing firms posted the worst operating results in their history, with losses of \$1.4 billion. Refineries are currently operating at only 50 to 55 percent of capacity. For the petroleum industry to provide stable oil supplies and the increasing quantities of lighter grade oil products that the economy will demand, a restructuring of the industry is essential. To this end, the government has called for the scaling down of refining capacity by 1 million b/d and is promoting the development of heavy oil-cracking technologies in the industry. In addition, the Japan Development Bank currently offers loans at favorable rates for new investment projects. []

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Electricity Generation

Because of rising electricity demand, the largest increase in Japanese energy requirements over the next two decades will occur in electric utilities. Electricity generation, however, will fall short of government projections by approximately 20 percent, according to Japanese private-sector forecasts. Oil consumption in this sector will decline sharply; Japanese private-sector forecasts place oil use at 22 percent of total utility energy needs in 1990 compared

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Table 3
Japan: Electricity-Generation Costs

US Cents/kWh

Nuclear power	4.4
Coal	5.6
Oil and LNG	7.0-7.4

Source: Japan's *Atomic Energy White Paper* for 1982.

1990 are required to make coal a break-even proposition in new power plants. Should the new lower oil prices be viewed as sustainable, construction schedules of new coal-fired power plants could well be scrapped or delayed indefinitely. On the gas front, several LNG projects could be postponed indefinitely as lower returns would make these large capital investment projects uneconomic. Moreover, because of the long leadtimes needed to bring gas reserves to market, no new supplies would be available should energy prices recover by the early 1990s.

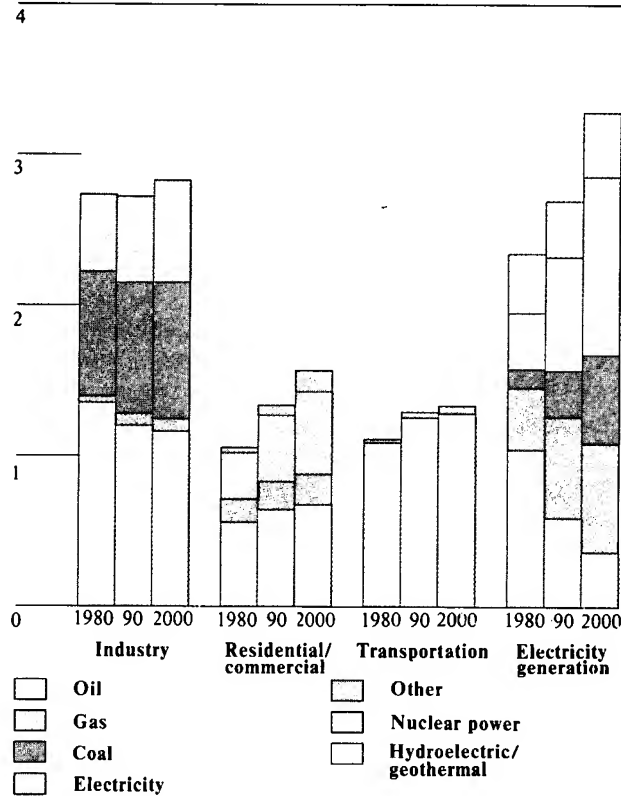
Import Dependence

Because of its limited domestic oil-production potential, Japan will have to rely on imports for nearly all of its oil requirements through the year 2000 (figure 7). We believe that the bulk of these imports will have to come from politically unstable Persian Gulf sources because the region contains 60 percent of non-Communist oil reserves. Thus, Japan will remain extremely vulnerable to oil-supply disruptions over the next two decades. In recent years, moreover, Japan has increased direct purchases of crude oil from oil-producing countries at the expense of major oil companies (table 4). As a result, the potential for producer leverage on Japan has increased while market buffers provided by oil company distribution systems have decreased.²

² Contrary to popular political belief in Japan, the allocation of oil supplies by international oil companies following the 1973 oil crisis allowed Japan to suffer less than other countries: Japan experienced only a 3-percent shortfall below forecast supplies, compared to an 11-percent shortfall for the United States and a 19-percent shortfall for Western Europe. In 1973, major oil companies supplied about 80 percent of Japan's oil.

Figure 5
Sectoral Energy Demand

Million b/d oil equivalent



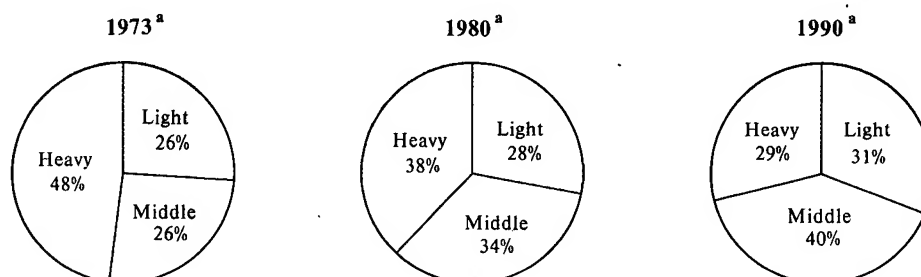
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Although Japan will rely on imports for the bulk of its gas and coal needs, imports of coal and LNG pose far less of a security risk than oil. Current and proposed contracts indicate that Japan is expected to be importing LNG from six to seven different sources in 1990. Major suppliers include Indonesia, Abu Dhabi, and Malaysia. Moreover, if all of the LNG projects now under way are completed as scheduled, we believe supplies to Japan will begin to exceed demand by

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Figure 6
Domestic Oil Demand



Categories include—light: gasoline, naptha; middle: jet fuel oil, kerosene, gas oil, heavy oil A; heavy: heavy oils B and C.

^aFiscal year.

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1985. In addition, Japan probably could withstand a major LNG supply disruption as long as alternative oil supplies could be obtained. Japanese electric utilities—the principal gas consumers—maintain a significant ability to switch to alternative fuels. Currently, 62 percent of LNG-fired capacity can switch to alternative fuels, and by 1990 the utilities will have the capability to cut gas consumption by nearly 40 percent of total gas use. [REDACTED]

As for coal, international supplies currently exceed demand, and export capability is likely to exceed demand through at least the 1990s, according to market forecasts. Because of the abundance of suppliers and surplus export capacity, coal supplies would have to be disrupted simultaneously from several sources to cause severe problems. We believe Australia, the United States, and Canada—which provide around 90 percent of Japan's imported coal—will remain Japan's principal coal suppliers over the next two decades. Either Australia or the United States could compensate for any foreseeable disruptions in supplies from other countries. [REDACTED]

Energy Security Implications³

The uncertain political climate in the Middle East and the frequency of past oil-supply disruptions underscore the potential for future disturbances. Although the odds are against a major disruption in oil exports in any particular exporting nation or region, the probability that some sort of disruption will occur is quite high. [REDACTED]

The impact of a cutoff in Middle East oil supplies on Japan depends on the nature and extent of the disruption. We believe that the effect of an Arab oil embargo solely against Japan would be negligible unless accompanied by sizable production cuts. Without production cutbacks, oil companies and trading firms can meet preexisting consumption patterns by reallocating supplies within their distribution networks. Of more concern, however, is the possible [REDACTED]

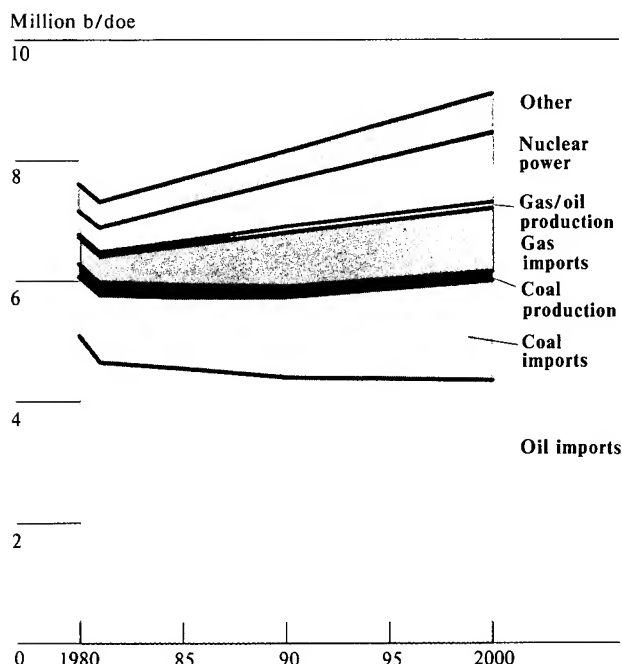
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Figure 7
Energy Supply and Demand



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alteration of Japanese foreign policy in an attempt to secure a resumption of normal oil deliveries. Following the 1973 Arab oil embargo, for example, Japan issued a statement endorsing Palestinian rights and indicating that it might reconsider its policy toward Israel. [REDACTED]

Japan and other oil importers would be hurt by deep, sustained production cuts (table 5). Because of heavy non-Communist dependence on Persian Gulf oil—in particular Japanese and West European dependence—the United States would not be immune to the shocks of a major disruption in Middle East oil supply. Such disruptions would tend to lead to sharing of the burdens of the shortfall through adjustments in company distribution systems if the formal IEA oil-sharing program were implemented. Moreover, competition among consuming nation governments for the

Table 4
Japan: Crude Oil Purchases

Percent

	1977	1982
Major oil companies	68	44
Oil-producing countries	19	44
Japanese producers	8	9
Independents	5	3

remaining oil supplies could raise world prices. Stockpiling by Japan and other importers following the Iranian revolution, for example, helped exacerbate tight market conditions and drive up world oil prices.

Government Energy Security Policies

With limited domestic energy resources, Japan can only enhance its energy security by diversifying energy imports among fuels and sources of supply. Given numerous constraints, we believe there is little potential for Japan to significantly expand its use of nonoil energy sources beyond estimated levels. Increased use of LNG, for example, would require the reconsideration of pricing practices and "take or pay" clauses. Although there are moves to improve contract conditions because of the current buyer's market, industry sources do not expect much progress in the near future. LNG projects are highly capital intensive, and as a result producers require a guaranteed market and considerable returns on investment before proceeding with construction. [REDACTED]

We believe Japan's desire to minimize costs while enhancing energy security probably precludes a significant increase in the use of other energy sources. A myriad of technical problems complicate coal use in industry, for example; any expansion in coal consumption rests largely with electric utilities. Because industry studies indicate that new coal-fired plants cannot economically replace existing oil-fired facilities, government financial assistance would be required. In

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Table 5
Japan: Key Economic
Variables

*Average annual
percent change*

	Average GNP Growth Rate	Average Inflation Rate	
		Producer Price Index	Consumer Price Index
1970-73	9.1	4.4	7.6
1974-75 ^a	0.5	13.7	17.4
1976-79	5.0	3.0	6.3
1980-81 ^b	3.5	7.7	6.3

^a Crude oil prices increased 290 percent following the 1973 oil embargo.

^b Crude oil prices increased 170 percent following the Iranian revolution.

addition, we believe environmental regulations must be eased in some locations, and electricity-rate compensation schemes could be required to ensure public acceptance. An Institute of Gas Technology assessment indicates that a large increase in synthetic fuels would require huge government subsidies because of the uneconomic nature of synfuels production and the immense capital requirements. As for nuclear power, public opposition and siting difficulties must be overcome.

Given Japan's present and projected heavy reliance on imported oil, Japan could lessen its vulnerability to an oil cutoff by:

- Increasing efforts to diversify oil supplies away from Persian Gulf sources.
- Boosting government-owned oil stocks.
- Easing or reversing the trend toward increased reliance on producer countries for oil supplies rather than on major oil companies.
- Strengthening the refining sector to ensure sufficient production of lighter grade oil products.

The US Option

Some US Government officials have indicated that Japanese energy security could be improved by allowing increased exports of US domestic energy supplies to Japan, such as Alaskan oil, Alaskan LNG, and US coal.

Alaskan Oil. Shipments of Alaskan oil to Japan have been discussed since the 1973 oil crisis. Annual Japanese imports of 500,000 b/d of Alaskan oil could reduce the Persian Gulf's share of Japan's imports by about 10 percentage points and lessen Arab leverage on Japan. The export of Alaskan oil, however, is currently forbidden by US law and faces considerable domestic opposition in Congress and from US shipping interests. Japanese desire to acquire Alaskan oil, moreover, appears to be waning largely because of the present soft oil market. According to State Department reporting, although both the Japanese Government and private industry would welcome the removal of the prohibition on Alaskan oil exports—primarily for long-term security considerations—Japanese liftings of Alaskan oil would be unlikely to exceed 100,000 b/d under present market conditions. Japanese companies, moreover, would be interested in Alaskan oil only if it could be supplied on a commercial basis and competitive terms, implying their opposition to any requirements for US tankers or a US emergency escape clause that would halt exports in an emergency. Given dampened Japanese enthusiasm in the current soft market, we believe it is unlikely that Japan would be willing to make significant new reciprocal concessions to obtain Alaskan oil.

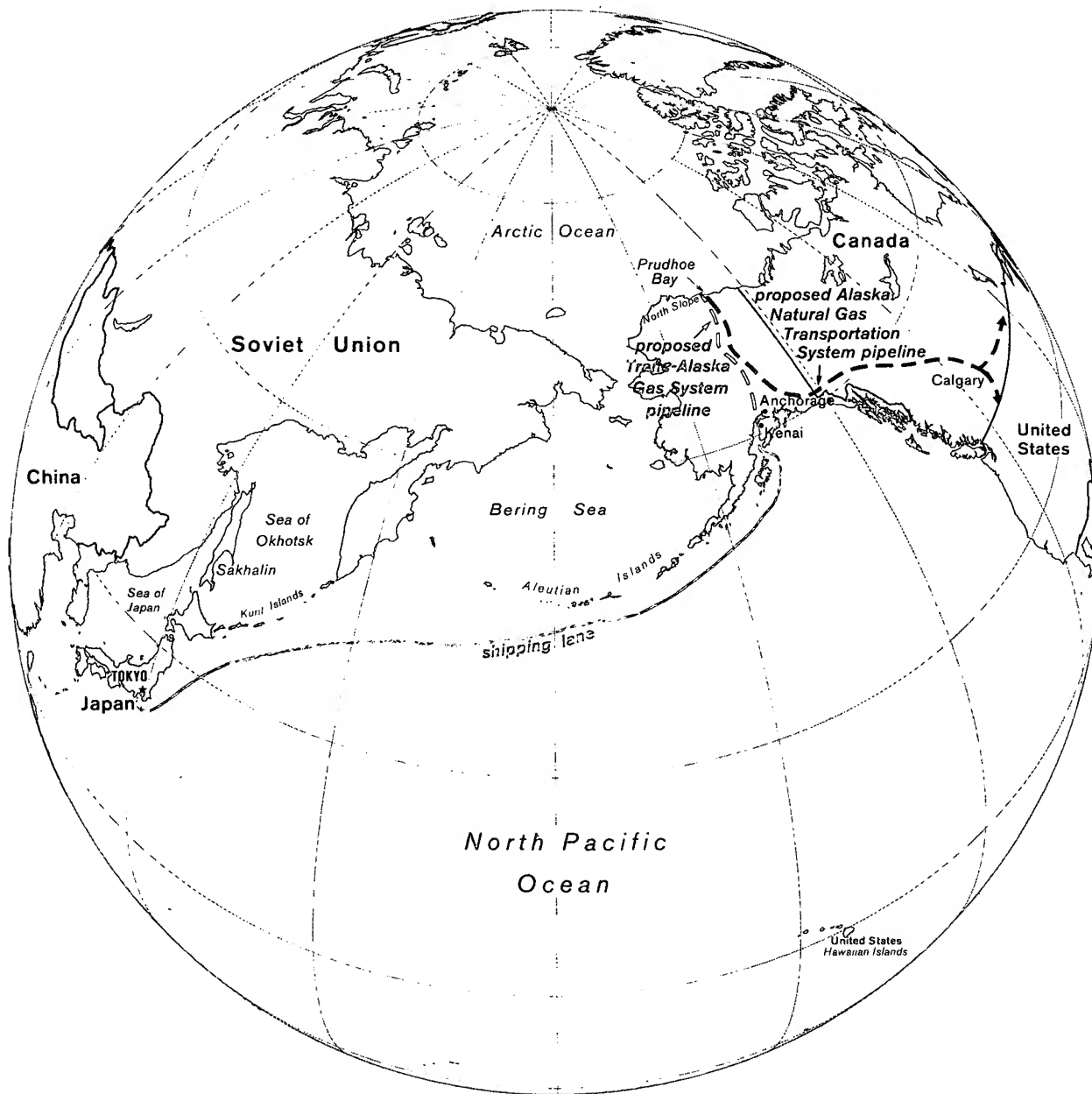
Alaskan LNG. Japan has been importing about 25,000 b/doe of Alaskan LNG annually since 1969. Currently, there is a proposal for exporting Alaskan North Slope natural gas to Japan that envisions a 1,320-km pipeline to carry North Slope gas to southern Alaska for liquefaction and shipment to Japan (figure 8).

the LNG would be competitive in the Japanese market in 1988—when deliveries of 125,000 b/doe could technically begin. Japan, however, has already contracted for all the gas it will need until 1990 (table 6). Beyond 1990, LNG requirements are likely to stagnate or increase only slightly, according to industry sources. Although the expiration of some existing contracts will necessitate additional purchases beginning in 1993, the required volume will be insufficient to support the proposed capacity (370,000 b/doe) of the pipeline (figure 9).

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Figure 8
Export of Alaskan North Slope Gas Through Proposed Pipelines



Boundary representation is not necessarily authoritative.

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Table 6
Japan: LNG Supply/Demand

Thousand b/doe

	1980	1985	1990	1995	2000
LNG demand	434	655	900	950-1,000	1,000-1,100
LNG supply	434	710	955	825	745
Existing contracts					
Alaska	22	25			
Brunei	143	130	130		
Abu Dhabi	50	55	55	55	
Indonesia	219	220	220	220	195
Projects under construction or agreed to					
Indonesia-Badak		80	80	80	80
Indonesia-Arun		85	85	85	85
Malaysia		115	155	155	155
Australia			155	155	155
USSR-Sakhalin			75	75	75
Supply (shortfall)/surplus		55	55	(125-175)	(255-355)
Potential suppliers					
Canada			75	75	75
Thailand			50-100	50-100	50-100
Indonesia-Natuna				150-200	150-200
Qatar			155	155	155
Abu Dhabi			95	125	240

US Coal. Japan is the largest purchaser of US coal. We believe that prospects for significantly increasing US coal sales to Japan are bleak. US coal is currently the most expensive purchased by Japan, and the Japanese are reluctant to sign long-term contracts with US suppliers until prices are more competitive with exports from Australia and South Africa. Moreover, recent private-sector forecasts place steam coal imports in 1990 at about 30 million tons—roughly half of 1980 projections. Consequently, major coal development projects in the western United States no longer appear necessary,

The Sakhalin Issue ⁴

Japanese efforts to increase energy security have been directed in part toward diversifying energy supplies. A point of contention between Japan and the United States has been Japanese participation in a joint venture with the USSR to tap the offshore gas resources at Sakhalin Island. Although the venture

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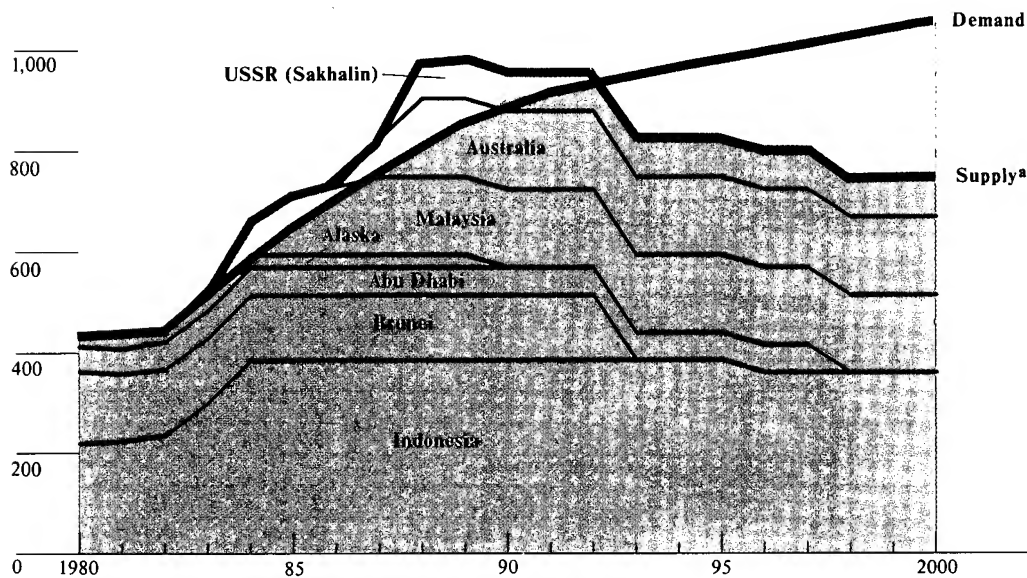
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Figure 9
Liquefied Natural Gas Supply and Demand

Thousand b/d oil equivalent

1,200



- ☐ Potential surplus
☐ Potential supply gap

^aBased on projects under construction or agreed to.

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has experienced poor planning and significant delays, we believe there are several reasons for the Japanese to continue the project:

- The Japanese already have a considerable investment in the project—\$170 million in exploration alone—much of which would be lost if the project were canceled. By the same token, Japan stands to gain a supply of gas at discount prices as well as lucrative Soviet business for its growing petroleum equipment industry if the project succeeds.
- For Japan, knowing that it is the only market for Sakhalin natural gas, participation in the project is an important element to maintaining good relations with the USSR.
- Dependent on Indonesia for over half of its LNG requirements, Japan is anxious to diversify its sources of supply, and nearby Sakhalin Island is a natural choice. It is closer to Japan than Alaska,

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Australia, or Malaysia and does not pose the same risk of political instability as do Abu Dhabi and Indonesia.

For these reasons Tokyo seems determined to proceed with the project, even though Japan could obtain all the liquefied natural gas it will need from a variety of other suppliers.

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